WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, said method comprising the steps of:

forming an amorphous semiconductor film on an insulating surface;

adding a catalytic element being capable of promoting crystallization to the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by controlling a light source to irradiate with a pulsed light to the amorphous semiconductor film to form a crystalline semiconductor film.

2. A method of manufacturing a semiconductor device, said method comprising the steps of:

forming an amorphous semiconductor film on an insulating surface;

adding a catalytic element being capable of promoting crystallization to the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by controlling a light source to irradiate with a pulsed light to the amorphous semiconductor film to form a crystalline semiconductor film,

wherein a light emitting time of the light source is in a range of 1 to 60 seconds.

3. A method according to claim 1, further comprising:

irradiating with a laser light to the crystalline semiconductor film to improve crystallinity thereof after the crystallizing step.

4. A method according to claim 1,

wherein the crystallizing step is performed in a reduced pressure atmosphere in a treatment chamber.

5. A method according to claim 1,

wherein the crystallizing step is performed in an atmosphere comprising oxygen at a concentration of in a range of 5 ppm or less in a treatment chamber.

6. A method of fabricating a semiconductor device, said method comprising the step of:

adding a catalytic element to an amorphous semiconductor film;

heating the amorphous semiconductor film to form a crystalline semiconductor film;

adding an impurity element to the crystalline semiconductor film;

irradiating with a pulsed light to the crystalline semiconductor film by controlling a light source,

wherein the catalytic element is gettered by irradiating with the pulsed light.

7. A method of fabricating a semiconductor device, said method comprising the step of:

adding a catalytic element to an amorphous semiconductor film;

heating the amorphous semiconductor film to form a crystalline semiconductor film;

adding an impurity element to the crystalline semiconductor film;

irradiating with a pulsed light to the crystalline semiconductor film by

controlling a light source,

wherein the catalytic element is gettered by irradiating with the pulsed light,

wherein a light emitting time of the light source in a range of is 1 to 40 seconds.

8. A method according to claim 6,

wherein the impurity element comprises at least an element selected from group 15 of the periodic table.

9. A method according to claim 6,

wherein the impurity element comprises at least a first element selected from group 15 of the periodic table and at least a second element selected from group 13 of the periodic table.

10. A method according to claim 6,

wherein the impurity element comprises at least a first element selected from group 15 of the periodic table, at least a second element selected from group 13 of the periodic table and at least a third element selected from group 18 of the periodic table.

11. A method according to claim 9,

wherein a concentration of the second element is 1/100 to 100 times as high as a concentration of the second element.

12. A method of fabricating a semiconductor device, said method comprising

the steps of:

adding a catalytic element to a first amorphous semiconductor film;

heating the first amorphous semiconductor film to form a crystalline semiconductor film;

forming a second amorphous semiconductor film on the crystalline semiconductor film;

adding an impurity element to the second amorphous semiconductor film;

gettering the catalytic element to the second amorphous semiconductor film by controlling a light source to irradiate a pulsed light to the crystalline semiconductor film.

13. A method according to claim 12,

wherein the impurity element comprises an element selected from group 18 of the periodic table.

14. A method according to claim 12,

wherein the impurity element comprises a first element selected from group 15 of the periodic table, a second element selected from group 13 of the periodic table and a third element selected from group 18 of the periodic table.

15. A method according to claim 6,

wherein an inside of a treatment chamber is exhausted, and a pressure in the treatment chamber is 26.6 Pa or less in the irradiating step.

16. A method according to claim 6,

wherein an atmosphere in a treatment chamber comprises oxygen at a concentration of 2 ppm or less.

17. A method according to claim 8,

wherein the element is selected from N, P, As, Sb and Bi.

18. A method according to claim 9,

wherein the second element is selected from B, Al, Ga, In and Tl.

19. A method according to claim 10,

wherein the third element is selected from Ar, Kr and Xe.

20. A method according to claim 1,

wherein a continuous holding time of a temperature exceeding a glass strain point is 20 seconds or less in the crystallizing step.

21. A method according to claim 1,

wherein a holding time of highest intensity of the light source is 1 to 5 seconds in the crystallizing step

22. A method according to claim 1,

wherein cooling using at least one selected from the group consisting of a nitrogen gas, an inert gas and a liquid as a refrigerant is carried out simultaneously in the crystallizing step.

23. A method according to claim 1,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the crystallizing step.

24. A method according to claim 1,

wherein the light source is a light source for emitting at least one selected from the group consisting of an infrared light and an ultraviolet light.

25. A method according to claim 1,

wherein at least one selected from the group consisting of a halogen lamp, a metal halide lamp, a xenon arc lamp and a reduced pressure mercury lamp is used as the light source.

26. A method according to claim 1,

wherein the light source irradiates a front side of the substrate, a rear side of the substrate, or the rear side and the front side of the substrate.

27. A method according to claim 1,

wherein the catalytic element comprises at least one selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

28. A method of fabricating a semiconductor device, said method comprising the steps of:

forming an amorphous semiconductor film on an insulating surface;

adding a catalytic element being capable of promoting crystallization to

a surface of the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by controlling a light source to irradiate a pulsed light to the amorphous semiconductor film to form a crystalline semiconductor film;

adding an impurity element to the crystalline semiconductor film;

gettering the catalytic element by controlling the light source to irradiate the pulsed light to the crystalline semiconductor film added with the impurity element.

29. A method of fabricating a semiconductor device, said method comprising the steps of:

forming an amorphous semiconductor film on an insulating surface;

coating a catalytic element being capable of promoting crystallization onto a surface of the amorphous semiconductor film to form a catalytic element inclusion region;

crystallizing the amorphous semiconductor film by controlling a light source to irradiate a pulsed light to the amorphous semiconductor film to form a crystalline semiconductor film;

adding an impurity element to the crystalline semiconductor film;

gettering the catalytic element by controlling the light source to irradiate the pulsed light to the crystalline semiconductor film added with the impurity element;

forming a semiconductor layer of a desired shape using the crystalline semiconductor film in which the catalytic element has been gettered;

forming a gate insulating film covering the semiconductor layer;

forming a gate electrode on the gate insulating film;

adding an n-type impurity element to the semiconductor layer;

adding a p-type impurity element to a portion of the semiconductor layer;

activating the n-type and p-type impurity elements in the semiconductor layer by controlling the light source to irradiate a pulsed light,

wherein the portion of the semiconductor layer is an active layer of a p-channel thin film transistor.

30. A method according to claim 29,

wherein the crystallizing step the activating step are carried out in a reduced pressure atmosphere in which an oxygen concentration is reduced by performing exhaustion by a rotary pump and a mechanical booster pump.

31. A method according to claim 28,

wherein the impurity element comprises an element selected from group 15 of the periodic table,

wherein the element is at least one selected from the group consisting of N, P, As, Sb and Bi.

32. A method according to claim 28,

wherein the impurity element comprises at least a first impurity element selected from group 15 of the periodic table and at least a second element selected from group 13 of the periodic table,

wherein the first element is at least one selected from the group consisting of N, P, As, Sb and Bi,

wherein the second element is at least one selected from the group

consisting of B, Al, Ga, In and Tl.

33. A method according to claim 28,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the crystallizing and gettering steps.

34. A method according to claim 28,

wherein the catalytic element comprises at least one selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu, and Au.

35. A method according to claim 1,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.

36. A method according to claim 2, further comprising:

irradiating with a laser light to the crystalline semiconductor film to improve crystallinity thereof after the crystallizing step.

37. A method according to claim 2,

wherein the crystallizing step is performed in a reduced pressure atmosphere in a treatment chamber.

38. A method according to claim 2,

wherein the crystallizing step is performed in an atmosphere comprising oxygen at a concentration of in a range of 5 ppm or less in a treatment chamber.

39. A method according to claim 2,

wherein a continuous holding time of a temperature exceeding a glass strain point is 20 seconds or less in the crystallizing step.

40. A method according to claim 2,

wherein a holding time of highest intensity of the light source is 1 to 5 seconds in the crystallizing step

41. A method according to claim 2,

wherein cooling using at least one selected from the group consisting of a nitrogen gas, an inert gas and a liquid as a refrigerant is carried out simultaneously in the crystallizing step.

42. A method according to claim 2,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the crystallizing step.

43. A method according to claim 2,

wherein the light source is a light source for emitting at least one selected from the group consisting of an infrared light and an ultraviolet light.

44. A method according to claim 2,

wherein at least one selected from the group consisting of a halogen lamp, a metal halide lamp, a xenon arc lamp and a reduced pressure mercury lamp is used as the light source.

45. A method according to claim 2,

wherein the light source irradiates a front side of the substrate, a rear side of the substrate, or the rear side and the front side of the substrate.

46. A method according to claim 2,

wherein the catalytic element comprises at least one selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

47. A method according to claim 2,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.

48. A method according to claim 10,

wherein a concentration of the second element is 1/100 to 100 times as high as a concentration of the second element.

49. A method according to claim 9,

wherein the first element is selected from N, P, As, Sb and Bi.

50. A method according to claim 10,

wherein the first element is selected from N, P, As, Sb and Bi.

51. A method according to claim 10,

wherein the second element is selected from B, Al, Ga, In and Tl.

52. A method according to claim 6,

wherein a continuous holding time of a temperature exceeding a glass strain point is 20 seconds or less in the irradiating step.

53. A method according to claim 6,

wherein a holding time of highest intensity of the light source is 1 to 5 seconds in the irradiating step.

54. A method according to claim 6,

wherein cooling using at least one selected from the group consisting of a nitrogen gas, an inert gas and a liquid as a refrigerant is carried out simultaneously in the irradiating step.

55. A method according to claim 6,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the irradiating step.

56. A method according to claim 6,

wherein the light source is a light source for emitting at least one selected from the group consisting of an infrared light and an ultraviolet light.

57. A method according to claim 6,

wherein at least one selected from the group consisting of a halogen lamp, a metal halide lamp, a xenon arc lamp and a reduced pressure mercury lamp is used as the light source.

58. A method according to claim 6,

wherein the light source irradiates a front side of the substrate, a rear side of the substrate, or the rear side and the front side of the substrate.

59. A method according to claim 6,

wherein the catalytic element comprises at least one selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

60. A method according to claim 6,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.

61. A method according to claim 7,

wherein the impurity element comprises at least an element selected from group 15 of the periodic table.

62. A method according to claim 7,

wherein the impurity element comprises at least a first element selected from group 15 of the periodic table and at least a second element selected from group 13 of the periodic table.

63. A method according to claim 7,

wherein the impurity element comprises at least a first element selected from group 15 of the periodic table, at least a second element selected from group 13 of the periodic table and at least a third element selected from group 18 of the periodic table.

64. A method according to claim 62,

wherein a concentration of the second element is 1 100 to 100 times as high as a concentration of the second element.

65. A method according to claim 63,

wherein a concentration of the second element is 1 100 to 100 times as high as a concentration of the second element.

66. A method according to claim 7,

wherein an inside of a treatment chamber is exhausted, and a pressure in the treatment chamber is 26.6 Pa or less in the irradiating step.

67. A method according to claim 7,

wherein an atmosphere in a treatment chamber comprises oxygen at a concentration of 2 ppm or less.

68. A method according to claim 61,

wherein the element is selected from N, P, As, Sb and Bi.

69. A method according to claim 62,

wherein the first element is selected from N, P, As, Sb and Bi.

70. A method according to claim 63,

wherein the first element is selected from N, P, As, Sb and Bi.

71. A method according to claim 62,

wherein the second element is selected from B, Al, Ga, In and Tl.

72. A method according to claim 63,

wherein the second element is selected from B, Al, Ga, In and Tl.

73. A method according to claim 63,

wherein the third element is selected from Ar, Kr and Xe.

74. A method according to claim 7,

wherein a continuous holding time of a temperature exceeding a glass strain point is 20 seconds or less in the irradiating step.

75. A method according to claim 7,

wherein a holding time of highest intensity of the light source is 1 to 5 seconds in the irradiating step

76. A method according to claim 7,

wherein cooling using at least one selected from the group consisting of a nitrogen gas, an inert gas and a liquid as a refrigerant is carried out simultaneously in the irradiating step.

77. A method according to claim 7,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the irradiating step.

78. A method according to claim 7,

wherein the light source is a light source for emitting at least one selected from the group consisting of an infrared light and an ultraviolet light.

79. A method according to claim 7,

wherein at least one selected from the group consisting of a halogen lamp, a metal halide lamp, a xenon arc lamp and a reduced pressure mercury lamp is used as the light source.

80. A method according to claim 7,

wherein the light source irradiates a front side of the substrate, a rear side of the substrate, or the rear side and the front side of the substrate.

81. A method according to claim 7,

wherein the catalytic element comprises at least one selected from the

group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

82. A method according to claim 7,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.

83. A method according to claim 12,

wherein an inside of a treatment chamber is exhausted, and a pressure in the treatment chamber is 26.6 Pa or less in the gettering step.

84. A method according to claim 12,

wherein an atmosphere in a treatment chamber comprises oxygen at a concentration of 2 ppm or less.

85. A method according to claim 14,

wherein the first element is selected from N, P, As, Sb and Bi.

86. A method according to claim 14,

wherein the second element is selected from B, Al, Ga, In and Tl.

87. A method according to claim 13,

wherein the element is selected from Ar, Kr and Xe.

88. A method according to claim 14,

wherein the third element is selected from Ar, Kr and Xe.

89. A method according to claim 12,

wherein a continuous holding time of a temperature exceeding a glass strain point is 20 seconds or less in the gettering step.

90. A method according to claim 12,

wherein a holding time of highest intensity of the light source is 1 to 5 seconds in the gettering step

91. A method according to claim 12,

wherein cooling using at least one selected from the group consisting of a nitrogen gas, an inert gas and a liquid as a refrigerant is carried out simultaneously in the gettering step.

92. A method according to claim 12,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the gettering step.

93. A method according to claim 12,

wherein the light source is a light source for emitting at least one selected from the group consisting of an infrared light and an ultraviolet light.

94. A method according to claim 12,

wherein at least one selected from the group consisting of a halogen lamp, a metal halide lamp, a xenon arc lamp and a reduced pressure mercury lamp is used as the light source.

95. A method according to claim 12,

wherein the light source irradiates a front side of the substrate, a rear side of the substrate, or the rear side and the front side of the substrate.

96. A method according to claim 12,

wherein the catalytic element comprises at least one selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

97. A method according to claim 12,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.

98. A method according to claim 28,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.

99. A method according to claim 29,

wherein the impurity element comprises an element selected from group 15 of the periodic table,

wherein the element is at least one selected from the group consisting of N, P, As, Sb and Bi.

100. A method according to claim 29,

wherein the impurity element comprises at least a first impurity element selected from group 15 of the periodic table and at least a second element selected from group 13 of the periodic table,

wherein the first element is at least one selected from the group consisting of N, P, As, Sb and Bi,

wherein the second element is at least one selected from the group consisting of B, Al, Ga, In and Tl.

101. A method according to claim 29,

wherein a vicinity of the crystalline semiconductor film is in at least one selected from the group consisting of a nitrogen (N_2) atmosphere, an inert gas atmosphere, a hydrogen (H_2) atmosphere and a reducing gas atmosphere in the crystallizing and gettering steps.

102. A method according to claim 29,

wherein the catalytic element comprises at least one selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu, and Au.

103. A method according to claim 29,

wherein the semiconductor device is one selected from the group consisting of a video camera, a digital camera, a front type projector, a rear type projector, a head mount display (goggle type display), a personal computer, a portable information terminal such as a mobile computer, a portable telephone or an electronic book.